

Thermal and Mechanical Microspacecraft Technologies for X-2000 Future Deliveries

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Abstract

Thermal and mechanical technologies are an important part of the X-2000 Future Delivery (X-2000 FD) microspacecraft. A wide range of future space missions are expected to utilize the technologies and the architecture developed by the X-2000 FD. These technologies, besides being small in physical size, make the tiny spacecraft robust and flexible. The X2000 FD architecture is designed to be highly reliable and suitable for a wide range of missions such as planetary landers/orbiters/flybys, earth orbiters, cometary flybys/landers/sample returns, etc. One of the key ideas used in the development of these technologies and architecture is that several functions be included in each of the thermal and mechanical elements.

One of the thermal architecture being explored for the X-2000 FD microspacecraft is integrated thermal energy management of the complete spacecraft using a fluid loop. The robustness and the simplicity of the loop and the flexibility with which it can be integrated in the spacecraft have made it attractive for applications to X-2000 FD. Some of the thermal technologies to be developed as a part of this architecture are passive and active cooling loops, electrically variable emittance surfaces, miniature thermal switches, and specific high density electronic cooling technologies.

In the mechanical area, multifunction architecture for the structural elements will be developed. The multifunction aspect is expected to substantially reduce the mass and volume of the spacecraft. Some of the technologies that will be developed are composite material panels incorporating electronics, cabling, and thermal elements in them.

The paper to be presented at the 1999 conference, will describe the progress made so far in the microspacecraft thermal and mechanical technologies and approaches for the X2000 Future Deliveries microspacecraft.